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REMARKS

Claims 1, 2, and 4-13 are in this application. Re-examination, reconsideration and allowance of this application is respectfully requested.

EXAMINER INTERVIEW

Applicant wishes to thank Examiner Alexander for the courtesies that were extended to the undersigned during a telephone interview on April 9, 2003, in which the Examiner indicated a pending restriction requirement between the invention of claims 1, 2, and 4-13 (apparatus), and the invention of claims 3 and 14-18 (method). Agreement was reached to cancel claims 3 and 14-18 in response to the prospective restriction requirement. It is believed that Applicant retains the right to file a divisional application directed to claims 3 and 14-18 in further response to the restriction requirement.

REJECTIONS UNDER 35 U.S.C. 102(b) and 103

Claims 4-13 were rejected under 35 U.S.C. 102(b) as being anticipated by each of the Anderson, Bienkowski, Luchaco and Ezoe et al. references; and claims 1 and 2 were rejected under 35 U.S.C. 103 as being unpatentable over Anderson, Bienkowski, Luchaco and Ezoe et al. alone or in view of the Zeleski reference. These rejections are respectfully traversed.

The Applied References

The Anderson reference discloses an automotive emission control system having a universal exhaust gas oxygen sensor located between series-connected upstream filter and

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downstream main exhaust catalysts, and a control system responsive to the sensor for adjusting the engine air/fuel ratio. Compensation for chemical aging of the upstream catalyst is obtained by adjusting an initial control loop gain based on empirically established rates of degradation of the upstream catalyst and the sensor, the loss in sensor gain with aging offsetting the effect of increased passage of noxious gaseous effects through the upstream catalyst. Applicant emphasizes that once the sensor of an operational system is installed and connected in the closed-loop system, *no testing of the sensor is disclosed*. Also, there is no description of "empirically determining the degradation rate of said sensor with normal usage reduces the gain of the sensor" (quoted from claim 26).

The Bienkowski reference discloses an oxygen sensor monitor having a plug power connection to a vehicle cigarette lighter socket and a lead for connection to the output of the installed oxygen sensor. The sensor output is buffered and compared with a 0.45 volt reference, an indicator light being responsive to the comparison. Normal closed-loop operation is evidenced by flashing of the indicator light at a low repetition rate (1-4 Hz). Applicant emphasizes that the indication is only whether the signal is above 0.45 volts (richer than stoichiometric) which gives virtually no information on sensor operation, e.g. how rich or lean, range of operation, or reaction speed.

The Luchaco reference discloses a fuel injection system including a failure detection system for the exhaust gas sensor. The failure detection system includes a control circuit that enables failure detection when engine operating parameters such as temperature, fuel flow, RPM, and throttle setting are indicative of the engine being hot and idling for a sufficient period relative to thermal time constants. When enabled by the control circuit, a transition interval indicator determines whether sensor transitions are rapid (normal) or slow (abnormal), the

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abnormal condition being latched and suitably indicated to the operator. The output of the transition interval indicator also modifies the timing of a subset of fuel injectors to effect a periodically lean mixture. Applicant emphasizes that the failure detection system is effective for detecting essentially catastrophic failures under operation near stoichiometric (450mV), not over a full range of operation which is typically from below 175mV to above 800mV.

The Ezoc et al. reference discloses a diagnostic monitoring device that measures the frequency of the feedback control signal of an engine air/fuel ratio control system to estimate the state of the gas sensor. In one embodiment, indicator lamps show whether the frequency is above or below a predetermined level; in another, whether the frequency is within a predetermined range is indicated. Applicant emphasizes that the monitoring device is operative only under specific operating conditions of the engine to produce an appropriate operating temperature of the sensor (such as  $1900 < \text{RPM} < 2100$  for one minute, and the engine being at operating temperature). The failure detection system is effective for detecting essentially catastrophic failures under operation near stoichiometric (450mV). Also disclosed is a tester for verifying that the internal resistance of the sensor (when disconnected from the control system) is within a predetermined range, such as between 100 k ohms and 500 k ohms.

The Zeleski reference discloses a microprocessor based tester that interacts with the computer data bus to exercise various electronic subsystems and monitor responses thereto. A keyboard is provided for overriding pre-programmed diagnostics.

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Argument

The rejection of claims 4-13 under 35 U.S.C. 102(b) is believed to be inappropriate because none of the applied references nor any of the other references discloses any of the following:

1. The combination of an electronic circuit for receiving an oxygen sensor signal and having a simulate output for connection to a vehicle on-board computer in place of the oxygen sensor signal, with logic for driving the simulate output in (a) a closed loop mode, the simulate output directly following the oxygen sensor signal, and (b) a simulate mode, the simulate output being driven arbitrarily in isolation from the oxygen sensor signal for forcing the engine to run one or both of lean and rich, and a display for indicating the oxygen sensor signal (claims 4 and 12);
2. The above combination with an additional test mode, the simulate output being driven arbitrarily in isolation from the oxygen sensor signal for forcing the engine to run lean, and the logic monitoring the time response of the oxygen sensor signal between lean running and rich running of the engine (claims 5 and 12);
3. The above combination wherein the logic means signals a ready condition in the test mode when the engine reaches a stable lean condition, then enabling measurement of the time response of the oxygen sensor signal indicating operation passing from lean toward rich (claims 6 and 12);
4. The above combination wherein the oxygen sensor signal has a range including a first value representing a lean condition, the ready condition being signaled only after a predetermined interval of operation with the sensor signal representing a more lean operating condition (claims 7 and 12);
5. The second combination above, including a timer for measuring an interval between the oxygen sensor signal having a first value representing a lean condition and a second value representing a rich condition, and circuitry for signaling a passing condition of the sensor if the measured interval is sufficiently short (claim 9).

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It is respectfully submitted that none of the references is in anticipation of Applicant's invention. As the CCPA has stated:

"Rejections under 35 U.S.C. 102 are proper only where the claimed subject matter is identically disclosed or described in prior art (citation). In other words, to constitute an anticipation, all material elements recited in a claim must be found in one unit of prior art." *In re Marshall*, 198 USPQ 344, 346 (CCPA 1973).

It is clear that none of the references that were cited by the Examiner nor any of the other references satisfies this test. Applicant emphasizes that as to the rejected claims 4 and 12, the references disclose nothing regarding driving an oxygen sensor input of a fuel injection system arbitrarily in isolation from the sensor. More particularly, the fuel injection systems of Anderson and Luchaco, and the monitoring devices of Bienkowski and Ezoe et al., each always maintain a connection from the oxygen sensor to apparatus controlling air/fuel ratios, whereas Applicant's invention has at least one operating mode in which the simulate output to *the oxygen sensor input of the fuel system is driven in an arbitrary manner in isolation from the oxygen sensor*. Also, the additional gas sensor detector (Fig. 4) of Ezoe et al., while being connected to a switch for disconnecting the sensor from the feedback control (oxygen sensor input), that sensor input is left open, and is *not* driven in an arbitrary manner as claimed by Applicant. It is clear that this additional detector is used only for measuring the internal impedance of the sensor as disclosed at Col. 11, lines 25-29, and there is no monitoring of a sensor reaction to arbitrary driving of the sensor input. The apparatus of Ezoe et al., as well as those of Anderson, Bienkowski, and Luchaco, thus can not be in anticipation of Applicant's claimed invention in that only Applicant provides both a closed loop mode in which the simulate output directly follows the sensor input and an open-loop mode in which the simulate output is driven in an arbitrary manner in isolation from the sensor input. Further, none of the references discloses a display of the oxygen sensor

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output, the additional detector of Ezoe et al. indicating only whether the internal impedance of the sensor is within a preset range.

Moreover, these rejected claims are not rendered obvious by the references, in that none of the references, either alone or in combination, discloses or suggests Applicant's multiple modes of operation including the closed loop mode in which the simulate output directly follows the oxygen sensor input, and an open loop mode in which the simulate output is driven in an arbitrary manner in isolation from the sensor signal.

The dependent claims 5-11 and 13 are further believed to be allowable based on the subject matter of claims 1 and 12 from which they depend, because they further limit allowable subject matter, and because they contain additional limitations that are neither disclosed or suggested by the prior art as outlined above.

Accordingly, it is believed that the rejection of claims 4-13 under 35 U.S.C. 102(b) has been overcome by the above remarks; withdrawal thereof is respectfully requested.

Regarding the rejection of claims 1 and 2 under 35 U.S.C. 103, it is believed that the rejection of claim 1 is inappropriate for the reasons discussed above, in that claim 1 corresponds generally to the first two combinations outlined above, with the additional limitations of a housing having a keypad with indicator lights. More particularly, claim 1 requires the claimed analyzer to have a closed loop mode showing dynamic operation of the oxygen sensor, a simulated mode in which the sensor is monitored with simulated sensor signals being fed to the vehicle computer, and a test mode in which the engine is forced to run lean without propane injection. None of the references, alone or in combination, either disclose or suggest Applicant's

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combination, in which both a closed loop mode of operation, and an open loop mode with simulated oxygen sensor signals input to the vehicle computer.

Regarding claim 2, none of the references discloses or suggests applicant's series connectability of the analyzer between the sensor and the on-board computer for evaluating the sensor's performance. As indicated above, the apparatus of each of the references, with the exception of the additional gas sensor detector of Ezoe et al., always operate closed loop in response to the oxygen sensor. Also, the additional detector of Ezoe et al. only measures the internal impedance of the sensor and does not include means for evaluating the sensor's *performance* relative to pre-established acceptable standards.

Accordingly, it is believed that the rejection of claims 1 and 2 under 35 U.S.C. 103 has been overcome by these remarks; allowance thereof is respectfully requested.

In view of the above, it is believed that this application, including each of the claims 1, 2, and 4-13, is in condition for allowance. Such allowance is respectfully requested. If for some reason the Examiner considers otherwise, it is respectfully requested that a telephone call be placed to the undersigned so that issuance of a patent can be expedited.

Respectfully submitted,

SHELDON &amp; MAK

Date:

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